Conventional laboratory techniques for the detection of toxic cyanobacteria and cyanotoxins

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Introduction

Over recent years, it has become apparent that toxic cyanobacterial blooms are on the increase, presenting a hazard to animal and human health. Microcystins have been extensively studied and reported over recent years. Despite the number of microcystin-variants and lack of standards, a large number of biological and chemical methods have been optimised for a variety of matrices, usually cells, water and tissue. Data on chronic and acute toxicity have led to the WHO to set a guideline maximum of 1 µg per litre in drinking water. Methods developed for microcystins are suitable for the pentapeptide nodularins, although they usually occur in brackish water.

In contrast, relatively little work has been done on methods detection of other known toxins, anatoxins, cylindrospermopsins, BMAA and aplysiatoxins. Saxitoxins being the exception, as they occur widely in the marine environment and many methods have been developed for their detection in shellfish. However, there has been only limited application of these methods to freshwater samples. There are many challenges in assessing and selecting suitable methods since blooms can not only be composed of co-occurrence of species but it is also known that some species produce multiple classes of toxins.

Methods

This paper reviews methods presented in the literature, many of which are currently used for routine monitoring and in research. We discuss the application, validation, cost and practicability of a range of techniques. Priorities, future needs and challenges are addressed.

Results

Monitoring of cyanobacteria and their associated toxins is application dependent. Many methods are available, however, few have been validated for even a single sample matrix. Common obstacles include lack of standards and certified reference materials, lack of country specific guidelines and funding.

Conclusion

More validation of current methods is needed, including sampling protocols, clean-up concentration as well as analysis. Rapid effective screens/multi-screens followed up by qualitative/quantitative analysis will provide the essential decision making data needed for successful management strategies.